Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (Currently amended) A wavefront measurement system comprising:

a source of electromagnetic radiation;

an illumination system that directs the electromagnetic radiation uniformly at an object plane;

a first grating adapted to be positioned in the object plane [[that]] to condition ~~conditions~~ the electromagnetic radiation, wherein lines of the first grating comprise a plurality of dots;

a projection optical system that projects an image of the first grating onto a focal plane;

a second grating at the focal plane; and

a detector behind the second grating that receives a fringe pattern produced by the second grating.

2. (Original) The system of claim 1, wherein the second grating is a two-dimensional grating.

3. (Original) The system of claim 2, wherein the two-dimensional grating is a checkerboard grating.

4. (Original) The system of claim 2, wherein the two-dimensional grating is a cross-grating.

5. (Original) The system of claim 1, wherein the first grating is a reflective grating.

6. (Original) The system of claim 1, wherein the second grating includes a regular pattern of absorptive regions and transmissive regions.

7. (Original) The system of claim 1, wherein the source is an Extreme Ultraviolet (EUV) radiation source.

8. (Original) The system of claim 1, wherein the source is a 13.5 nm radiation source.

9. (Original) The system of claim 1, wherein the first grating is mounted on a reticle stage.

10. (Original) The system of claim 1, wherein the second grating is mounted on a wafer stage.

11. (Original) The system of claim 1, wherein the first grating is oriented at 45 degrees relative to the second grating.

12. (Original) The system of claim 1, wherein a pitch of the first grating is equal to a pitch of the second grating times a magnification factor of the projection optical system.

13. (Original) The system of claim 1, wherein the first grating is a checkerboard grating.

14. (Original) The system of claim 1, wherein the first grating is a linear grating.

15. (Currently amended) The system of claim 1, further including a third grating oriented orthogonally to the first grating and ~~positionable in the object plane in~~

~~place of the first grating~~ adapted to be positioned in the object plane to condition the electromagnetic radiation.

16. (Original) The system of claim 1, wherein the detector is a charge coupled device (CCD) detector.

17. (Original) The system of claim 1, wherein the second grating is formed on a silicon nitride substrate.

18. (Original) The system of claim 1, wherein the second grating is formed on a silicon substrate.

19. (Original) The system of claim 1, wherein the first grating is formed on a silicon nitride substrate.

20. (Original) The system of claim 1, wherein the first grating is formed on one of a quartz substrate and a silicon substrate.

21. (Original) The system of claim 1, wherein the second grating includes a plurality of absorptive areas formed of metal.

22. (Original) The system of claim 1, wherein a pitch of the first grating is such that a second order diffraction pattern disappears at the focal plane.

23. (Original) The system of claim 1, wherein the detector receives a zeroth order diffraction image of a pupil of the projection optical system and +/- 1^{st} order diffraction images of the pupil of the projection optical system.

24. (Original) The system of claim 1, wherein the first grating fills an input numerical aperture of the projection optical system.

25. (Original) The system of claim 1, wherein the first grating smoothes illumination irregularities of an input pupil of the projection optical system.

26. (Original) The system of claim 1, wherein the first grating maximizes electromagnetic radiation incident onto the projection optical system that can form fringes in a fringe plane.

27. (Currently amended) A wavefront measurement system comprising:

a source of electromagnetic radiation;

an imaging system that focuses the electromagnetic radiation at an object plane;

a first grating, positioned on a reticle stage, that is adapted to generate ~~generates~~ a diffraction pattern at a focal plane, wherein lines of the first grating comprise a plurality of dots;

a projection optical system that projects an image of the first grating onto the focal plane;

a second grating positioned on a wafer stage that receives a diffracted image of the first grating; and

a detector positioned on the wafer stage in the focal plane that receives the image of a pupil of the projection optical system through the second grating.

28. (Original) The system of claim 27, wherein the second grating is a two-dimensional grating.

29. (Original) The system of claim 28, wherein the two-dimensional grating is a checkerboard grating.

30. (Original) The system of claim 28, wherein the two-dimensional grating is a cross-grating.

31. (Original) The system of claim 27, wherein the first grating is a reflective grating.

32. (Original) The system of claim 27, wherein the second grating includes a regular pattern of absorptive regions and transmissive regions.

33. (Original) The system of claim 32, wherein the absorptive regions include nickel.

34. (Original) The system of claim 27, wherein the source is an Extreme Ultraviolet (EUV) radiation source.

35. (Original) The system of claim 27, wherein the source is a 13.5 nm radiation source.

36. (Original) The system of claim 27, wherein the first grating is oriented at 45 degrees relative to the second grating.

37. (Original) The system of claim 27, wherein a pitch of the first grating is equal to a pitch of the second grating times a magnification factor of the projection optical system.

38. (Original) The system of claim 27, wherein the first grating is a checkerboard grating.

39. (Original) The system of claim 27, wherein the first grating is a linear grating.

40. (Currently amended) The system of claim 27, further including a third grating on the reticle stage, the third grating being oriented orthogonally to the first grating and ~~positionable in an optical path in place of the first grating~~ adapted to generate a diffraction pattern at the focal plane.

41. (Original) The system of claim 27, wherein the detector is a CCD detector.

42. (Original) The system of claim 27, wherein the second grating is formed on a silicon nitride substrate.

43. (Original) The system of claim 27, wherein the second grating is formed on a silicon substrate.

44. (Original) The system of claim 27, wherein the first grating is formed on a quartz substrate.

45. (Original) The system of claim 27, wherein the first grating is formed on a silicon substrate.

46. (Original) The system of claim 27, wherein the second grating includes a plurality of absorptive areas formed of metal.

47. (Original) The system of claim 46, wherein the metal is nickel.

48. (Original) The system of claim 27, wherein a duty cycle of the first grating is such that a second order diffraction pattern of the source disappears at the focal plane.

49. (Original) The system of claim 27, wherein a duty cycle of the first grating is 50%.

50. (Original) The system of claim 27, wherein a duty cycle of the second grating is such that a second order diffraction pattern from the second grating disappears at a fringe plane.

51. (Original) The system of claim 27, wherein a duty cycle of the second grating is 50%.

52. (Original) The system of claim 27, wherein the detector receives a zeroth order diffraction image of an output pupil of the projection optical system and +/- 1st order diffraction images of the output pupil of the projection optical system.

53. (Original) The system of claim 24, wherein the second grating forms a shearing interferometer.

54. (Original) The system of claim 27, wherein a shear ratio of the second grating is approximately 1/30.

55. (Original) The system of claim 27, wherein the second grating has a pitch of approximately 1.62 μm.

56. (Original) The system of claim 27, wherein the first grating has a pitch of approximately 6.4 μm.

57. (Original) The system of claim 27, wherein an output numerical aperture of the projection optical system is approximately 0.25.

58. (Original) The system of claim 27, wherein an input numerical aperture of the projection optical system is approximately 0.0625.

59. (Original) The system of claim 27, wherein a magnification of the projection optical system is approximately 4X.

60. (Currently amended) A system for EUV photolithography comprising:
an EUV source emitting EUV radiation;

an imaging system that uniformly illuminates an object plane with the EUV radiation;

a reticle stage for mounting a reticle in an object plane;

a first grating, positioned on a reticle stage, that generates a diffraction pattern at a focal plane, wherein lines of the first grating comprise a plurality of dots;

a projection optical system that optically conjugates the focal plane and the object plane;

a wafer stage;

a second grating in the focal plane and positioned on the wafer stage; and

a detector positioned on the wafer stage that receives multiple images of a pupil of the projection optical system through the second grating.

61. (Currently amended) A method of measuring a wavefront of an optical system comprising:

generating electromagnetic radiation at a source;

directing the electromagnetic radiation at an object plane of the optical system;

positioning a first grating in an optical path of the optical system ~~that generates conditioning~~ to generate a diffraction pattern at a focal plane of the optical system, wherein lines of the first grating comprise a plurality of dots;

conjugating the focal plane and the object plane;

positioning a detector below the focal plane and a second grating at the focal plane;

receiving multiple images of a pupil of the projection optical system through the second grating; and

calculating wavefront parameters from the image.